''Heavy Metal''—A Useful Term

*Graeme E Batley**†*

†Centre for Environmental Contaminants Research, CSIRO Land and Water, Locked Bag 2007, Kirrawee, NSW 2232, Australia

(Submitted 6 December 2011; Accepted 20 January 2012)

DEAR SIR:

Recently I became aware that the editor of Learned Discourses has a personal campaign for the abolition of the term ''heavy metal.'' As a long-time researcher of the environmental chemistry and ecotoxicology of heavy metals, I feel that I should present a defense of the term. In looking over my publications list, I noted that I have used the term ''heavy metals'' in the title of some 13 articles, and an untold number of times within these and many other publications. I have also presented talks in the ''Heavy Metals in the Environment'' conference series, so I would say that the term has long been a regular part of my working vocabulary.

Why have I felt it necessary to use the term ''heavy metal''? When I began research in this area in the early 70s, ''heavy metal'' was already a well-established term, whose usage predated its adoption as a music genre in the late 60s and early 70s. The fact that this latter usage is more well-known by the general public is no reason that environmental scientists should feel obliged to discard it. Indeed, I felt comfortable in using a term that I believed adequately discriminated between the metals of environmental concern and those other, notionally ''light'' metals such as Na, K, Ca, and Mg, which are all major ion constituents of natural waters, soils, and sediments.

Were I to write an article on ''Metals in the Aquatic Environment,'' there might be an expectation that I cover all metals, light and heavy, when the former are of minor environmental interest. So what does ''heavy'' convey if included in the title?

The accepted definition of a heavy metal is largely restricted to the transition metals, because these are the metals of environmental concern as anthropogenic contaminants and potential toxicants, notwithstanding that many of them are indeed essential for biotic life. A logical extension is to include the lanthanide and actinide elements; however, these are somewhat specialized examples that are not routinely studied, and might not be expected to be included in a study of heavy metals. Arsenic is a metalloid and Se borderlines between metalloid and a nonmetal, so my definition would exclude them from being called heavy metals, otherwise my proposed article would be titled ''Heavy Metals and Metalloids in the Aquatic Environment.''

It does not bother me that I cannot define the prefix ''heavy'' in some quantifiable way. A Google search shows a number of attempts to define heavy metal from a chemical perspective, based on density, atomic weight, or atomic number, which were inexact and variable in their application. Duffus (2002) appears to have been campaigning among his fellow chemists for replacement of the term as indicated in a publication under the auspices of the International Union of Pure and Applied Chemistry (IUPAC). Apart from our editor, the objections from within the environmental science community amount to less than a whimper, because most either feel comfortable with the term, or have no strong opinions one way or the other.

Alternatives to ''heavy,'' such as ''toxic,'' ''available,'' or ''trace,'' all have different and more constrained meanings that would make subsets of heavy metals. From an environmental chemistry and ecotoxicological perspective, I am quite comfortable with any definition of heavy metals that encompasses V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Mo, Ag, Cd, Au, Hg, Sn, and Pb, as these are the common heavy metals of environmental concern. Clearly this is not an exact definition, but it serves a very real and useful purpose. A more precise definition, if required, would refer to the periodic table of the elements to include the transition metals from Sc to Zn, Y to Cd, and La to Hg. In addition, the metals in Groups IIIA and IVA, namely Ga, In, Sn, Tl, and Pb should also be included.

I am firmly of the ''if it ain't broke don't fix it'' school, so until there is a better definition that encompasses the group of metals that commonly pose environmental concerns, I see no reason to abandon the prefix ''heavy'' as a well understood descriptor of these metals.

REFERENCES

Duffus JH. 2002. ''Heavy metals'' a meaningless term? (IUPAC Technical Report). *Pure Appl Chem* 74:793–807.

* To whom correspondence may be addressed: Graeme.batley@csiro.au

Published online in Wiley Online Library (wileyonlinelibrary.com).
DOI: 10.1002/ieam.1290